microsonic

Operating manual

Ultrasonic label and splice sensor with one or two switching outputs with IO-Link interface

esf-1/CF/A
esf-1/CDF/A
esf-1/7/CDF/A
esf-1/15/CDF/A

◈ IO-Link

Functional principle

An ultrasonic transmitter in the lower leg of the fork beams a fast sequence of pulses through the backing material. The sound pulses cause the backing material to vibration, so that a greatly attenuated sound save is beamed from the opposite side. The receiver in the upper leg of the fork receives and evaluates this sound wave.

The esf-1 sensor can be used as a label sensor and/or a splice sensor.

The backing material transmits a different signal level from the level with label or rather from the backing material with a splice. The difference between the backing material and backing with label or the web material and splice can be very subtle. To ensure reliable detection, the esf-1 sensor must therefore initially learn the signal level for the backing or web material.

With its three Teach-in methods, the esf-1 sensor can optimally be adjusted to any task configuration. With QuickTeach, there is also a simplified Teach-in procedure available.

Product description

- Assured detection of labels made of paper, metal or (transparent) plastic.
- Detection of splices of paper-, plastic- or metal webs.
- Detection of materials with weights from < 20 g/m^2 to >> 400 g/m^2; sheet metals and plastic films up to 0.2 mm thickness.
- Three standard Teach-in methods and optional QuickTeach.
- Parameterisable with LinkControl.
- Response time of 300 μs until label resp. splice is detected.
- Three fork depths of 70 mm, 86 mm and 165 mm.
- The esf-1 sensors are IO-Link capable according to specification V1.1.

Safety tips

- Read instruction manual before commissioning.
- Connection, installation and adjustment may only be carried out by expert personnel.
- Not a safety component as defined by the EU Machinery Directive.

Installation

- Install the esf-1 in such a way that the leg with the button is on top. This mounting position permits you to keep the measuring track optimally clean.
- Connect the conection line with the 4-pin M8 connector as shown in fig. 1, and with 5-pin M12 connector as shown in fig. 2.

Commissioning

- Turn the power supply.

Teach-in with push-button and control input

The Teach-in process can optionally be carried out with the button on the top leg of the fork or with the Teach-in input on pin 5 on the M12 connector or pin 2 on the M8 connector.

		colour
1	+U_B	brown
3	-U_B	blue
4	label/splice output F	black
2	Teach-in/Com	white

Fig. 1: Pin assignment of esf-1/CF and colour coding for microsonic connection lines

		colour
1	+U_B	brown
3	-U_B	blue
4	label/splice output F	black
2	web break output D	white
5	Teach-in/Com	grey

Fig.2: Pin assignment of esf-1/../CDF/A and colour coding of the microsonic connection lines

Notes using Teach-in

- The Teach-in/Com control input is parallel with the push-button.
- +U_B connected to the control input correponds to a key press.
- A Teach-in using the control input can also be carried out with synchronisation active.
- Insert the web material into the fork. The material does not touch the fork. Carry out one of the three standard Teach-in methods or QuickTeach.
- A failed teach-in is indicated by the flashing of the 3 LEDs.

Standard Teach-in

There are three Teach-in methods available:

- Dynamic Teach-in of label
- Separate Teach-in for backing material and labels
- Splice sensor

QuickTeach

With QuickTeach, you have optinional a simplified Teach-in process that you have to activate once before initial commissioning.

Notes using QuickTeach

- To use QuickTeach, you have to decide whether the sensor will act as a label or a splice detector.
- Once QuickTeach is activated, you can't switch between NCC/NOC any more.

Operation

The esf-1 continually performs measurements and sets the switched outputs based on its results. Operation modes see fig. 3.

operation mode	LED green	LED yellow	LED red
ready to operate	on	-	-
backing material	on	off	off
label/splice	on	on	off
web break	on	off	on
error in Teach-In	flash	flash	flash

Fig. 3: LED display

Factory setting

The esf-1 sensors have the following settings configured at the factory:

esf-1/CF/A
- Label/splice output F on high active.
- QuickTeach is deactivated.

esf-1/../CDF/A
- Label/splice output F on high active.
- Output D on web break display.

- Output web break on NOC.
- QuickTeach is deactivated.

Synchronisation

If multiple esf-1 sensors are operated in tight space, they can influence one another. To avoid this, the esf-1 sensors can be synchronised. To do this, all Teach-in/com control inputs are connected together (see figs. 1 for the connector pinouts).

Parameterisation with LinkControl

The esf-1 can be extensively parameterised with LinkControl. To do this, you need the optionally available LCA-2 LinkControl adapter and the LinkControl software for Windows©.

Operation with LinkControl

- Install LinkControl-software at your PC.
  Connect the adapter to your PC using the usb cable.
- Connect the power supply cable at the T-connector of the LCA-2.
- Start the LinkControl-Software and follow the instructions on the screen.
- To connect the esf-1/CF/A with the LinkControl-Adapter you need an adapter cable M8 to M12.

You can make the following settings:
- NC/NO function of the switching outputs
- Function of the switching output D
- Teach-in procedure
- QuickTeach change
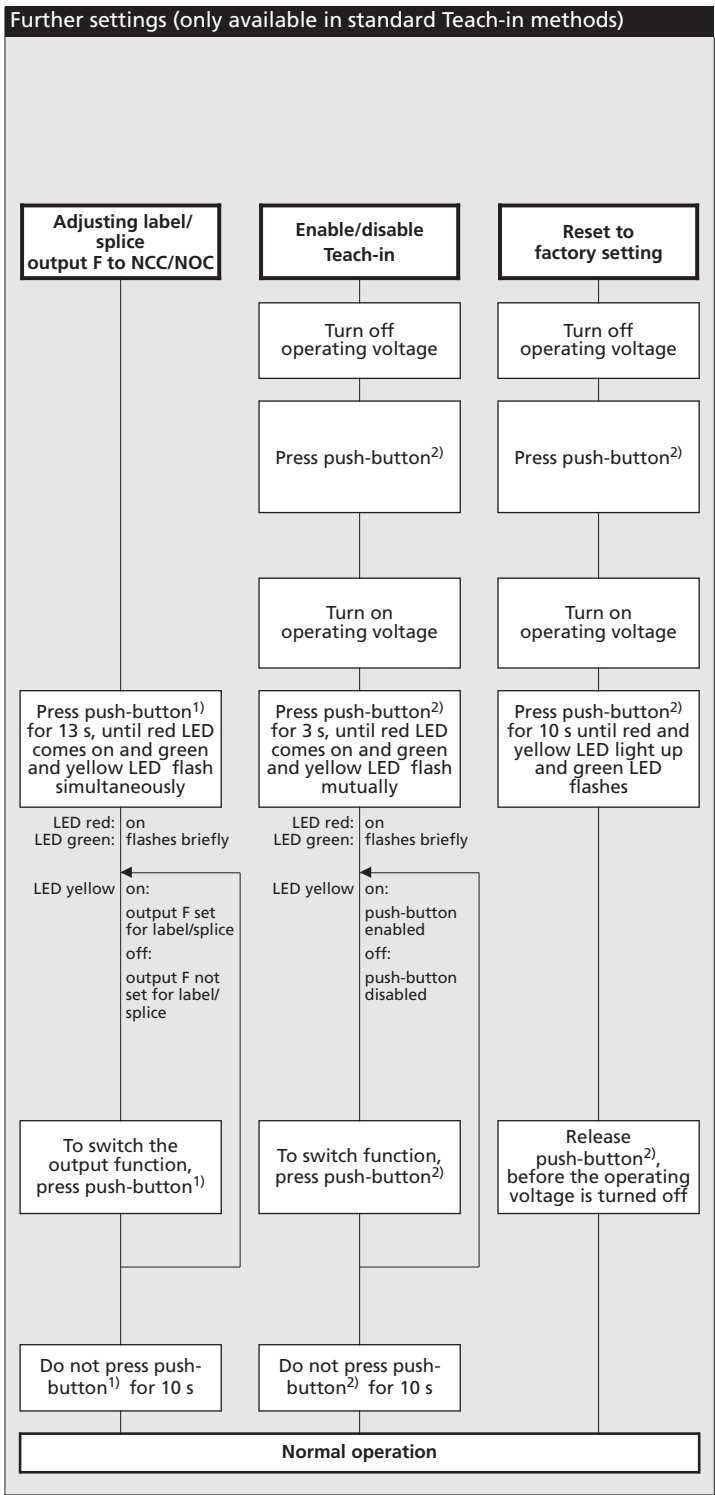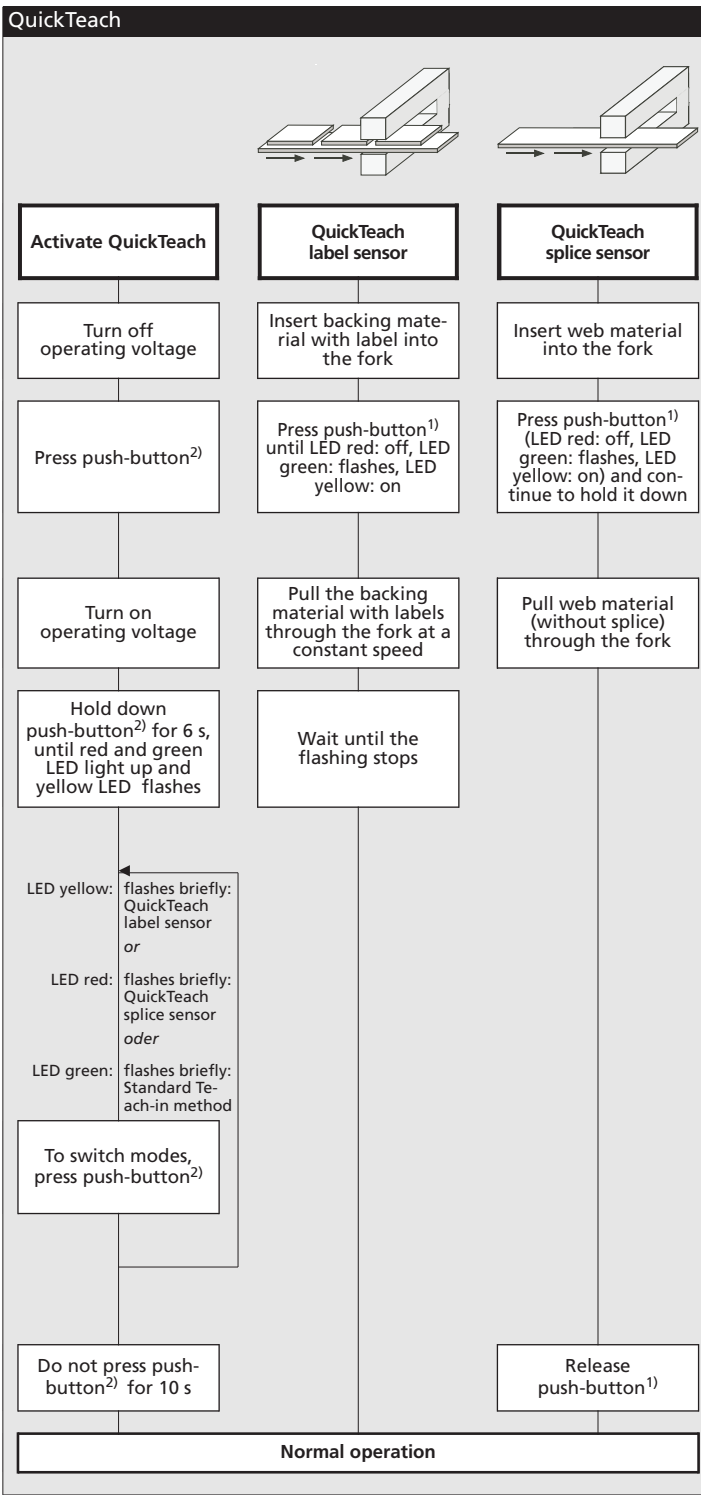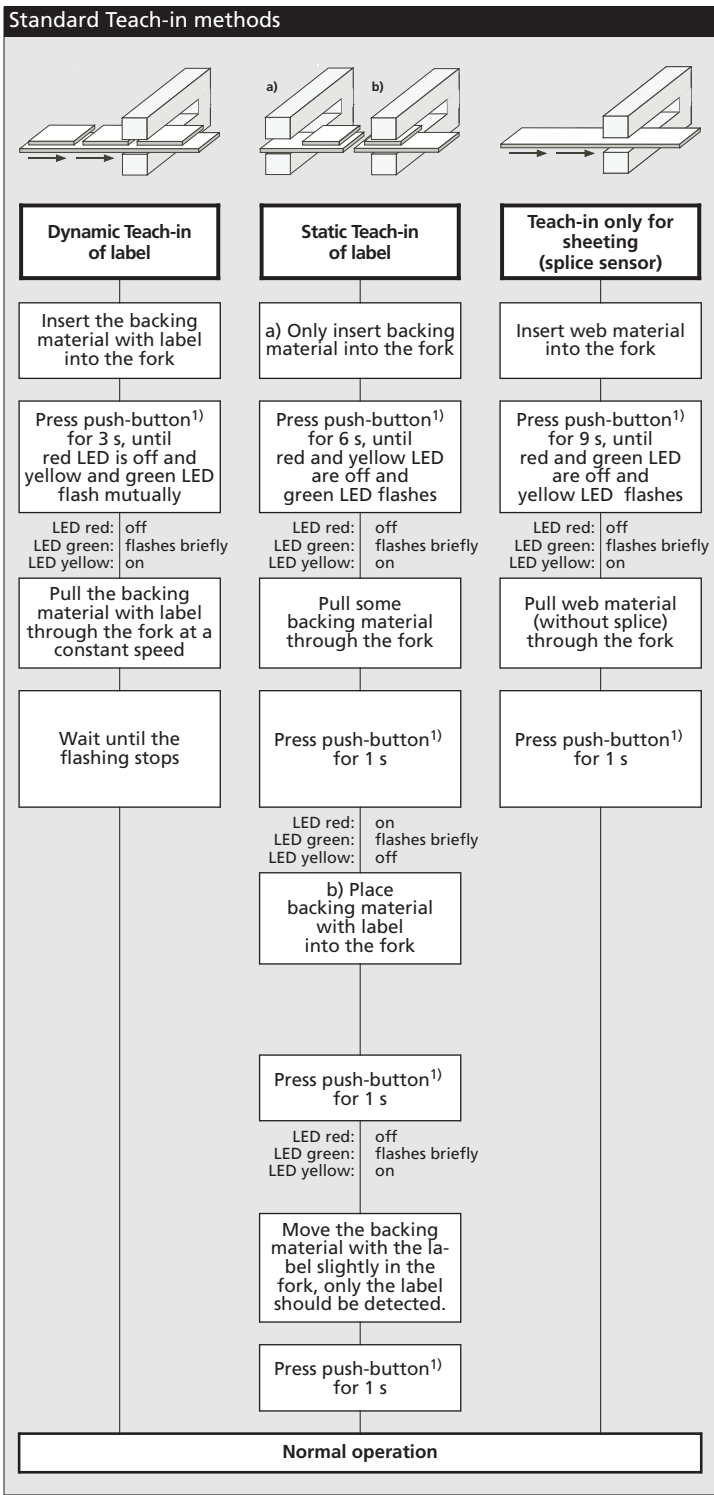
In addition, the measured values are shown in a graph.

IO-Link

- The latest IODD file and information about start-up and configuration of esf sensors with IO-Link, you will find online at: www.microsonic.de/esf.
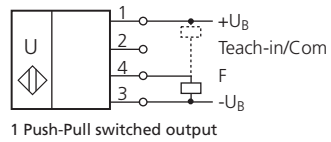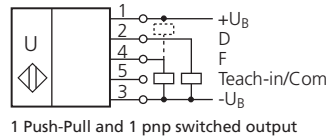
Maintenance

The esf-1 is maintenance-free. For significant deposits of dirt, we recommend carefully blowing out the measuring track with clean, oil-free compressed air.

Standard Teach-in methods

Dynamic Teach-in of label	Static Teach-in of label	Teach-in only for sheeting (splice sensor)
Insert the backing material with label into the fork	a) Only insert backing material into the fork	Insert web material into the fork
Press push-button[1] for 3 s, until red LED is off and yellow and green LED flash mutually	Press push-button[1] for 6 s, until red and yellow LED are off and green LED flashes	Press push-button[1] for 9 s, until red and green LED are off and yellow LED flashes
LED red: off / LED green: flashes briefly / LED yellow: on	LED red: off / LED green: flashes briefly / LED yellow: on	LED red: off / LED green: flashes briefly / LED yellow: on
Pull the backing material with label through the fork at a constant speed	Pull some backing material through the fork	Pull web material (without splice) through the fork
Wait until the flashing stops	Press push-button[1] for 1 s	Press push-button[1] for 1 s
	LED red: on / LED green: flashes briefly / LED yellow: off	
	b) Place backing material with label into the fork	
	Press push-button[1] for 1 s	
	LED red: off / LED green: flashes briefly / LED yellow: on	
	Move the backing material with the label slightly in the fork, only the label should be detected.	
	Press push-button[1] for 1 s	

Normal operation

QuickTeach

Activate QuickTeach	QuickTeach label sensor	QuickTeach splice sensor
Turn off operating voltage	Insert backing material with label into the fork	Insert web material into the fork
Press push-button[2]	Press push-button[1] until LED red: off, LED green: flashes, LED yellow: on	Press push-button[1] (LED red: off, LED green: flashes, LED yellow: on) and continue to hold it down
Turn on operating voltage	Pull the backing material with labels through the fork at a constant speed	Pull web material (without splice) through the fork
Hold down push-button[2] for 6 s, until red and green LED light up and yellow LED flashes	Wait until the flashing stops	
LED yellow: flashes briefly: QuickTeach label sensor *or*		
LED red: flashes briefly: QuickTeach splice sensor *oder*		
LED green: flashes briefly: Standard Teach-in method		
To switch modes, press push-button[2]		
Do not press push-button[2] for 10 s		Release push-button[1]

Normal operation

Further settings (only available in standard Teach-in methods)

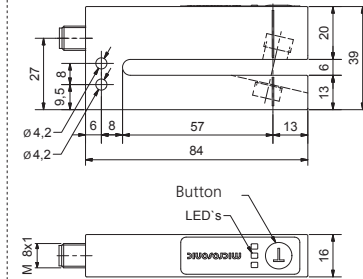| Adjusting label/splice output F to NCC/NOC	Enable/disable Teach-in	Reset to factory setting
	Turn off operating voltage	Turn off operating voltage
	Press push-button[2]	Press push-button[2]
	Turn on operating voltage	Turn on operating voltage
Press push-button[1] for 13 s, until red LED comes on and green and yellow LED flash simultaneously	Press push-button[2] for 3 s, until red LED comes on and green and yellow LED flash mutually	Press push-button[2] for 10 s until red and yellow LED light up and green LED flashes
LED red: on / LED green: flashes briefly	LED red: on / LED green: flashes briefly	
LED yellow: on: output F set for label/splice / off: output F not set for label/splice	LED yellow: on: push-button enabled / off: push-button disabled	
To switch the output function, press push-button[1]	To switch function, press push-button[2]	Release push-button[2], before the operating voltage is turned off
Do not press push-button[1] for 10 s	Do not press push-button[2] for 10 s	

Normal operation

1) All settings via push-button can alternatively be made by connecting the Teach-in/control input Com to +U$_B$.
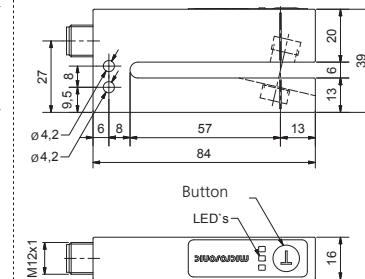2) All settings via push-button can alternatively be made by connecting the Teach-in/control input Com to -U$_B$.
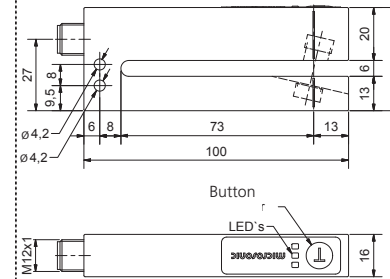
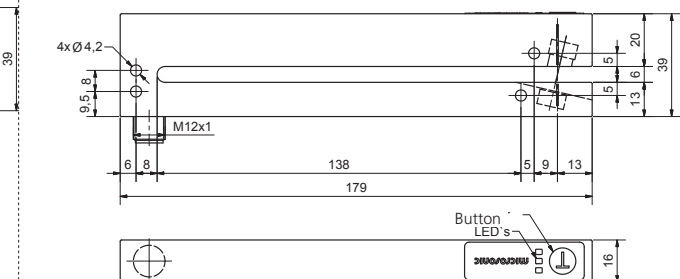|	esf-1/CF/A	esf-1/CDF/A	esf-1/7/CDF/A	esf-1/15/CDF/A
fork width	6 mm	6 mm	6 mm	6 mm
fork depth	70 mm	70 mm	86 mm	165 mm
transducer frequency	500 kHz	500 kHz	500 kHz	500 kHz
working range	web material with grammages of	web material with grammages of	web material with grammages of	web material with grammages of
	< 20 g/m^2 to >> 400 g/m^2, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	< 20 g/m^2 to >> 400 g/m^2, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	< 20 g/m^2 to >> 400 g/m^2, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	< 20 g/m^2 to >> 400 g/m^2, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material
operating voltage U$_B$	20 V to 30 V DC	20 V to 30 V DC	20 V to 30 V DC	20 V to 30 V DC
voltage ripple	± 10 %	± 10 %	± 10 %	± 10 %
no-load current consumption	≤ 50 mA	≤ 50 mA	≤ 50 mA	≤ 50 mA
type of connection	4-pin M8 initiator plug	5-pin M12 initiator plug	5-pin M12 initiator plug	5-pin M12 initiator plug
controls	Teach-in push-button, control input Pin 2	Teach-in push-button, control input Pin 5	Teach-in push-button, control input Pin 5	Teach-in push-button, control input Pin 5
programmable	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl
response time[1)]	300 µs – 2 ms, depending on the material	300 µs – 2 ms, depending on the material	300 µs – 2 ms, depending on the material	300 µs – 2 ms, depending on the material
indicator	LED green: working/backing material	LED green: working/backing material	LED green: working/backing material	LED green: working/backing material
	LED yellow: label/splice	LED yellow: label/splice	LED yellow: label/splice	LED yellow: label/splice
	LED red: web break	LED red: web break	LED red: web break	LED red: web break
	LEDs flash: Teach-in dismissed	LEDs flash: Teach-in dismissed	LEDs flash: Teach-in dismissed	LEDs flash: Teach-in dismissed
housing	aluminium anodized; plastic parts: PBT, PA;	aluminium anodized; plastic parts: PBT, PA;	aluminium anodized; plastic parts: PBT, PA;	aluminium anodized; plastic parts: PBT, PA;
	ultrasonic transducer: polyurethane,	ultrasonic transducer: polyurethane,	ultrasonic transducer: polyurethane,	ultrasonic transducer: polyurethane,
	epoxy resin with glass content	epoxy resin with glass content	epoxy resin with glass content	epoxy resin with glass content
class of protection to EN 60529	IP 65	IP 65	IP 65	IP 65
operating temperature	+5 °C to +60 °C	+5 °C to +60 °C	+5 °C to +60 °C	+5 °C to +60 °C
storage temperature	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C	-40 °C to +85 °C
weight	80 g	80 g	90 g	160 g
norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
time delay before availibility	< 300 ms	< 300 ms	< 300 ms	< 300 ms
order no.	esf-1/CF/A	esf-1/CDF/A	esf-1/7/CDF/A	esf-1/15/CDF/A
label/splice output F	Push-Pull, +U$_B$-3 V, -U$_B$+3 V, I$_{max.}$ = 100 mA,	Push-Pull, +U$_B$-3 V, -U$_B$+3 V, I$_{max.}$ = 100 mA,	Push-Pull, +U$_B$-3 V, -U$_B$+3 V, I$_{max.}$ = 100 mA,	Push-Pull, +U$_B$-3 V, -U$_B$+3 V, I$_{max.}$ = 100 mA,
	short-circuit-proof, switchable active/low active	short-circuit-proof, switchable active/low active	short-circuit-proof, switchable active/low active	short-circuit-proof, switchable active/low active
web break output D		pnp, +U$_B$-3 V, I$_{max.}$ = 100 mA,	pnp, +U$_B$-3 V, I$_{max.}$ = 100 mA,	pnp, +U$_B$-3 V, I$_{max.}$ = 100 mA,
		short-circuit-proof, switchable NOC/NCC	short-circuit-proof, switchable NOC/NCC	short-circuit-proof, switchable NOC/NCC

[1)] Can be programmed with Teach-in, IO-Link and LinkControl

The content of this document is subject to technical changes. Specifications in this document are presented in a descriptive way only. They do not warrant any product features.   MV-DO-198594-630789